

CLAIMS

1. A four-in pump comprising:
 - a gear box being arranged between a first and a second cylinder blocks;
 - a gearing means arranged within the gear box being connected with a driving shaft of a motor;
 - four eccentric shafts being mounted for possibly performing eccentric rotational motion, on the gearing means, respectively; and
 - 10 four pistons respectively mounted on the eccentric shafts being arranged in an upper and a lower volume chambers of the first cylinder block and in an upper and a lower volume chambers of the second cylinder block.
2. The four-in pump according to claim 1, wherein the gearing means 15 comprises a driving gear mounted on the driving shaft, and a first and a second driven gears cooperated with the driving gear.
3. The four-in pump according to claim 1 or 2, wherein the first driven gear has a first eccentric shaft for operating a first piston and a third eccentric shaft for operating a third piston, while the second driven gear has 20 a second eccentric shaft for operating a second piston and a fourth eccentric shaft for operating a fourth piston.
4. The four-in pump according to claim 2, wherein a center point of 25 rotation of the driving gear is displaced as much as a predetermined length to a direction of a vertical axis from a reference center point, and center points of rotation of the driven gears are also displaced as much as an eccentric distance of the driving gear to a direction of a vertical axis from reference center points.
- 30 5. The four-in pump according to claim 1, wherein the first and the third eccentric shafts are fit in a first driven gear so that each end of them faces each other, and fixed by a key and completely fixed in the first driven gear by means of a plurality of bolts.

6. The four-in pump according to claim 1, wherein the second and the fourth eccentric shafts are fit in a second driven gear so that each end of them faces each other, and fixed by a key and completely fixed in the second driven gear by means of a plurality of bolts.

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7. The four-in pump according to claim 2, wherein the driving gear and the two driven gears are a helical gear capable of vertically cooperating each other, for transferring power to the eccentric shaft vertically arranged with respect to the driving shaft.

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8. The four-in pump according to claim 7, wherein the two driven gears are reversed in their gear tooth directions.

15 9. The four-in pump according to claim 7, wherein the driving gear and the driven gears are a worm and a worm gear, respectively.

10. The four-in pump according to claim 1, wherein the piston comprises: the eccentric shaft being relatively rotated with respect to a cylindrical body by means of a thrust bearing and a ball bearing; an outer peripheral surface of the cylindrical body being coated by elastic rubber; a bolt passing through a front cap being joined to a tap hole of the eccentric shaft; a spring being arranged between the front cap and the ball bearing; a front seal being arranged in front of the front cap, for sealing the cylindrical body; a rear cap being arranged at an opening in a rear part of the body; and a sealing member of a circular shape being arranged in the rear cap.

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11. A four-in pump having: a gear box being arranged between a first and a second cylinder blocks; a gearing means arranged within the gear box being connected with a driving shaft of a motor; four eccentric shafts being mounted for possibly performing eccentric rotational motion, on the gearing means, respectively; pistons respectively mounted on the eccentric shafts being arranged in an upper and a lower volume chambers of the first cylinder block and in an upper and a lower volume chambers of the second cylinder

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block, respectively; the four-in pump comprising:

- an upper piston has a bearing housing arranged in its piston housing;
- a bearing being mounted in an inside of the bearing housing;
- the eccentric shaft being fit in the bearing; and

5 an inner peripheral surface of the piston housing being of an elliptical shape and an outer peripheral surface of the bearing housing being of an elliptical shape, so that a gap is formed between the piston housing and the bearing housing.

10 12. The four-in pump according to claim 11, wherein a plurality of elastic O-rings is mounted on the outer peripheral surface of the bearing housing, for compensating for a part spaced by a gap.

15 13. The four-in pump according to claim 11, wherein construction and operation of a lower piston are the same as those of an upper piston, and further, construction and operation of an upper piston and a lower piston in a second volume chamber are also the same as those of the upper piston in the first cylinder block.

20 14. The four-in pump according to claim 11, wherein the gearing means comprises: the driving gear and the driven gears possibly cooperating each other around the rotational central axis without eccentricity, and rotational speeds of the eccentric shafts possibly changing through change of power transferring rate by change of a module for the gears.

25 15. A four-in pump comprising:
a gear box being arranged between a first and a second cylinder blocks;
a gearing means arranged within the gear box being connected with a
30 driving shaft of a motor;
two shafts being mounted on the gearing means, respectively; and
pistons respectively mounted on the shafts being arranged in an upper
and a lower volume chambers of the first cylinder block and in an upper and
a lower volume chambers of the second cylinder block, respectively.

16. The four-in pump according to claim 15, wherein the driving gear and the driven gears of the gearing means are cooperated, so that the shafts mounted on the driven gears could be rotated and taper parts having the same 5 rotational axis lines as the rotational central axis lines of the shafts are formed at both ends of the shafts, and eccentric pistons displaced with respect to the rotational central axis lines of the shafts are mounted on the taper parts.

10 17. The four-in pump according to claim 16, wherein the shafts have the taper parts on which the eccentric pistons are mounted so that eccentric positions of the pistons could be arbitrarily adjusted and operation order of the eccentric pistons could be arbitrarily set.

15 18. The four-in pump according to claim 16 or 17, wherein an inner peripheral surface of a piston housing in the eccentric pistons is of an elliptical shape and an outer peripheral surface of a bearing housing mounted on an inner peripheral surface of the piston housing is of an elliptical shape, so that a gap is formed between the inner peripheral surface of the piston 20 housing and the outer peripheral surface of the bearing housing.